REMARKS

By the present amendment, Claims 1 and 8 have been amended. Claims 1-4 and 6-12 remain pending in the application, with Claims 1 and 8 being independent claims. Claims 1-4 and 8-11 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shibutani (U.S. Patent Application Publication No. 2003/0002518 A1) in view of Naguib (an article entitled "A Space-Time Coding Modem for High-Data-Rate Wireless Communications") and newly cited Yi (U.S. Patent No. 6,094,427). Claims 6, 7 and 12 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shibutani in view of Naguib, Yi and Walton (U.S. Patent Application Publication No. 2004/0156328 A1).

Independent Claim 1 has been amended to recite, in part, an apparatus for transmitting a sequence for channel estimation through M transmission antennas in a mobile communication system, the apparatus comprising: a sequence generator for generating the sequence for the channel estimation; P encoders for receiving P information bit streams and encoding the received P information bit streams with a space-time trellis code (STTC); M modulators for modulating information bit streams encoded from the P encoders as a punctured code into modulation symbol streams respectively; M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams output from the M modulators; and M multiplexers individually connected to the M transmission antennas, for multiplexing each of the punctured signals output from the M puncturers and the sequence to be inserted in the predetermined position, wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period. Claim 8 has also been amended in a similar manner.

Shibutani describes a slot assignment algorithm. Yi describes a communication system handoff operation combining Turbo Coding and soft handoff techniques. Naguib describes a

space-time coding modem for high-data-rate wireless communications. Walton describes random access for wireless multiple-access communication systems.

The Examiner concedes that Shibutani fails to disclose M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams output from the M modulators, and wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period.

The Examiner states that Yi suggests these recitations in FIG. 6 and from col. 14, line 35, through col. 15, line 40. The Examiner asserts that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Shibutani with the alleged suggestions of Yi.

The Examiner also concedes that Shibutani is not specific about inserting the sequence in at least one punctured modulation symbol.

The Examiner states that Naguib suggests these recitations on page 1460, col. 1, paragraph 1, and asserts that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Shibutani with the alleged suggestions of Naguib.

As the Examiner knows, the present invention relates to an apparatus and method for transmitting/receiving a pilot sequence in a mobile communication system using space-time trellis code. In the present invention, the multiplexers puncture a modulation symbol in a predetermined position and insert the sequence in the predetermined position for channel estimation.

The present invention is allowable over Shibutani, Naguib, Yi, or any combination thereof, for at least the following reasons.

First, Shibutani discloses a puncturer 146 and a multiplexer (MUX) 147 in FIG. 3, and describes puncturing a modulation symbol and then multiplexing the punctured modulation symbol with a pilot symbol. However, according to FIG. 1 and paragraphs 43-46 of Shibutani, the pilot symbol is not inserted in the position of the punctured modulation symbol, but is transmitted by a separate time slot.

Considering the above, Shibutani fails to disclose that the modulation symbol is punctured and the pilot symbol is transmitted instead of the punctured modulation symbol in accordance with the present invention. That is, Applicants respectfully submit that Shibutani fails to disclose multiplexing each of the punctured signals output from the M puncturers and the sequence **to be inserted in the predetermined position**, as recited in Claim 1 and similarly recited in Claim 8.

Second, the present invention additionally discloses that M puncturers puncture at least one modulation symbol in a predetermined position for each of the modulation symbol streams output from the M modulators. In addition, Claims 1 and 8 have been amended to recite that P information bit streams are received and encoded with an STTC. Therefore, considering a basic characteristic of an STTC coding scheme, each of the modulation symbol streams output from the M modulators is generated by the modulation for coding bit streams output from the encoders according to the present invention.

Yi discloses puncturing coding bit streams output from a turbo encoder 502, shown in FIG. 5, that includes first and second constituent recursive convolutional encoders 602A and 602B, respectively, as shown in FIG. 6. Further, Yi discloses that the punctured sequence output from the first constituent recursive convolutional encoder 602A is different from the punctured sequence output from the second constituent recursive convolutional encoder 602B.

Considering the input in a similar manner, Yi implies that the puncturing position in the first constituent recursive convolutional encoder 602A is different from that of the second constituent recursive convolutional encoder 602B.

However, Yi explains from col.13, line 59, through col. 15, line 40, that neither the first constituent recursive convolutional encoder 602A nor the second constituent recursive convolutional encoder 602B perform puncturing of the modulation symbol, but that the two encoders output different punctured sequences (parity bit streams) through inputting the identical sequences (the parity bit stream output from the first constituent recursive convolutional encoder and the second constituent recursive convolutional encoder) in a single turbo encoder.

Considering the above, Yi fails to disclose the feature in relation to puncturing the modulation symbol. Applicants respectfully submit that Yi fails to suggest "puncturing **at least one modulation symbol**" and "at least one of puncturing positions for the **modulation symbol streams**", as recited in Claim 1 and similarly recited in Claim 8.

Third, considering the combination of Shibutani and Yi, Shibutani discloses puncturing the modulation symbol and Yi discloses puncturing the encoding bit sequence. Therefore, Shibutani and Yi disclose a different type of a puncturing method, such that one skilled in the art at the time the invention was made would fail to arrive at the present invention based on their disclosures. In addition, one skilled in the art would find no teaching, suggestion, or would reasonably predict replacing the puncturing disclosed in Shibutani with the puncturing disclosed in Yi, and would not consider such a combination of Shibutani and Yi to be possible.

In other words, even presuming that the skilled artisan replaced the channel coding 142 of Shibutani with puncturing in the turbo encoder 502 as described by Yi, would one would fail to arrive at the present invention recitation of "puncturing the modulation symbol in a

predetermined position for each of the modulation symbol streams and inserting a pilot symbol instead of the punctured modulation symbol."

Fourth, the present invention discloses the feature of the puncturing in which the pilot symbol is inserted instead of the punctured modulation symbols in a predetermined position for each of the modulation symbol streams output from the M modulators.

Naguib merely discloses that the transmitter inserts **periodic** orthogonal pilot sequences in each of the simultaneously transmitted bursts. That is, Naguib discloses periodically inserting orthogonal pilot sequences in each of the simultaneously transmitted bursts. However, Naguib fails to suggest puncturing the modulation symbol in a predetermined position for each of the modulation symbol streams obtained by an STTC scheme and inserting the pilot symbol in the punctured position in accordance with the present invention.

Fifth, the Examiner is relying on a combination of three references, e.g. Shibutani, Yi, and Naguib, where none of the three references provide any suggestion, motivation, or would enable the skilled artisan to reasonably predict the present invention.

More particularly, Shibutani, Naguib, Yi, Walton, or any combination thereof, fails to teach, suggest, or reasonably predict an apparatus for transmitting a sequence for channel estimation through M transmission antennas in a mobile communication system, the apparatus comprising: a sequence generator for generating the sequence for the channel estimation; P encoders for receiving P information bit streams and encoding the received P information bit streams with a space time trellis code (STTC); M modulators for modulating information bit streams encoded from the P encoders as a punctured code into modulation symbol streams respectively; M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams output from the M modulators; and M multiplexers individually connected to the M transmission antennas, for multiplexing each of the punctured signals output from the M puncturers and the sequence

to be inserted in the predetermined position, wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period, as recited in Claim 1 and similarly recited in Claim 8.

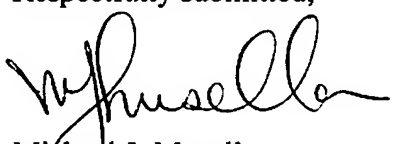
The Examiner has failed to establish a *prima facie* case of obviousness based on Shubutani, Yi, Naguib, or any combination thereof, for at least these reasons.

Accordingly, amended Claims 1 and 8 are allowable over Shibutani, Naguib, Yi, Walton, or any combination thereof.

While not conceding the patentability of the dependent claims, *per se*, Claims 2-4, 6, 7 and 9-12 are also allowable for at least the above reasons.

Accordingly, all of the claims pending in the Application, namely, Claims 1-4 and 6-12, are in condition for allowance. Should the Examiner believe that a telephone conference or personal interview would facilitate resolution of any remaining matters, the Examiner may contact Applicants' attorney at the number given below.

Respectfully submitted,



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